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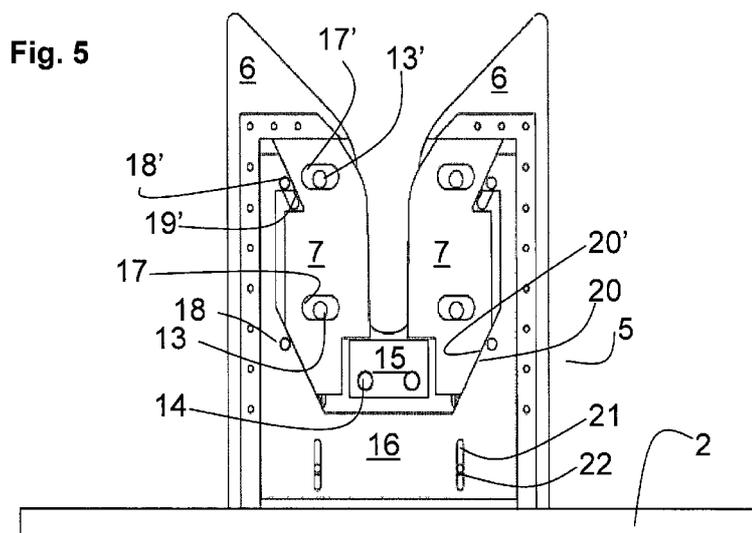
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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(U))
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(54) **Title:** LOCKING DEVICE



(57) **Abstract:** A locking device for temporary locking and securing of a chain, cable or wire, comprising a fork shaped main body (5) comprising two teeth (6) where clamps (7) extending from the teeth (6) towards each other, the clamps having substantially vertically arranged edges (7') facing each other and defining a substantially vertical gap (10) between the edges (7'), where the distance between the clamps being adapted to the diameter of a chain link or cable or a wire so that it may pass into the gap, but where a next chain link of a chain or a clamp on a cable or wire, is stopped against the clamps to lock or secure the chain, cable or wire, wherein the locking inserts are substantially linear and horizontally displaceable for adjustment of the gap (10) between the clamps (7) according to the diameter of the cable, wire or chain link, is described.

WO 2008/153411 A1

## LOCKING DEVICE

### The field of invention

The present invention relates to a method and device for temporarily securing or locking  
5 a chain or cable under tension during different operations. More specifically the present  
invention relates to an improved locking device, or a so-called "shark jaw", for a chain or  
a cable.

### Technical background

10 During several operations at the aft deck of a supply vessel or more specifically an  
anchor handling vessel, it is necessary to temporarily secure or lock a cable or chain  
under tension to perform operations such as, without limitations, shackling, connecting  
one chain with another, and substitution of parts of a cable or chain with another.  
Cable locks or chain locks of different kinds are routinely used for this purpose.

15

US 6.446.568 relates to improvements to a locking device for locking and securing  
cables or chains. The device comprises a "fork" structure comprising two substantially  
parallel teeth defining an opening there between in which opening one link of a chain  
may rest, so that the next link rests against the teeth of the fork. To give an effective  
20 locking without damaging the locking device and/or the chain, the distance between the  
teeth has to correspond to the dimension of the chain.

The main drawback with a locking device according to US 6.446.567 is that the opening  
defined between the teeth of the fork is constant, corresponding to the largest chain that  
25 may be used for that locking device. To adjust the device for a chain having smaller  
dimensions, inserts has to be installed. The inserts have to be manually mounted and  
secured by means of bolts, an operation which requires the presence of crew at the aft  
deck of the vessel.

30 US 4.423.697 (corresponding to NO 146271) relates to a hydraulically operated locking  
device for a cable or chain, comprising a jaw means having a pair of locking jaws that are  
moved towards/from one another by rotation of the jaw means about horizontal and  
parallel axis to close / open the locking device. The jaw means are rotated between the  
closed and open position by extracting/withdrawing a piston rod from/into a jack

cylinder, allowing the locking device to be remotely operated. The locking means is, however, designed for one dimension of chain / wire.

NO 180776 relates to an alternative locking device for a wire or chain onboard a vessel,  
5 the locking device comprising two claw means that maybe rotated about vertical axis of  
rotation between an open and a locked position. The locking means are also integrated  
with two guide rods. To avoid damaging the wire or chain when the locking means is in  
its locked positions, notches are provided in the claws to give an aperture between the  
claw means adapted to allow one dimension of wire or chain to be locked without being  
10 damaged.

During an offshore lifting operation, such as an anchor handling operation, the  
information about the dimension of chains and/or wires connected to equipment to be  
handled, is not always accurate. To handle such situations, the locking means have to be  
15 adjustable. Accordingly, the devices according to US .423.697 and NO 180776, are not  
an option for vessels for operations such as anchor handling.

US 6.446.568 is illustrative for the predominant locking devices for anchor handling  
vessels. As mentioned above, to adjust the locking device according to US 6.446.568, an  
20 insert, optionally substituting an existing insert, has to be installed on the locking device.  
The substitution and mounting of the inserts is manual work requiring crew at the aft  
deck. Of security reasons, it is however, a goal to avoid crew at the aft deck during  
anchor handling operation. In heavy weather, it may even be impossible to send  
personnel to the aft deck to exchange the inserts, a situation that may result in an  
25 expensive stop in a planned or otherwise necessary operation.

One object of the present invention is therefore to provide locking means for a chain  
and/or a cable, that makes it possible to reduce or even avoid the necessity of having  
personnel at the aft deck of a vessel during lifting operations, such as anchor handling  
30 operations.

Another object is to provide a locking means that reduces or avoids stops in planned or  
otherwise necessary operations, by providing a locking device that may be remotely  
controlled.

**Summary of the invention**

The above mentioned and other objects have been met by means of a locking device for temporary locking and securing of a chain, cable or wire, comprising a fork shaped main  
5 body comprising two teeth where clamps extending from the teeth towards each other, the clamps having substantially vertically arranged edges facing each other and defining a substantially vertical gap between the edges, where the distance between the clamps being adapted to the diameter of a chain link or cable or a wire so that it may pass into the gap, but where a next chain link of a chain or a clamp on a cable or wire, is stopped  
10 against the clamps to lock or secure the chain, cable or wire, wherein the locking inserts are substantially linear and horizontally displaceable for adjustment of the gap between the clamps according to the diameter of the cable, wire or chain link.

According to one embodiment, the clamps are arranged in a track in the main body of the  
15 locking device. By arranging the clamps in the main body of the locking device, the main body and the teeth of the main body may give the required support and strength to the device.

The track may be defined by a recess in the main body, a cover covering the recess, and a  
20 support member.

The locking device does according to one embodiment, include a substantially vertically displaceable clamp frame that is arranged in the groove and covered by the cover, the clamp frame comprising one or more slanting surface(s) that is/are arranged to interact  
25 on correspondingly slanting surface(s) on the clamps to displace the clamps substantially horizontally when the clamp frame is moved vertically.

According to one embodiment, guide pins fastened to the clamp frame, are arranged in  
30 corresponding slanting guide tracks arranged in the clamps.

According to another embodiment, guide pins fastened to the clamp, are arranged in corresponding slanting guide tracks arranged in the clamps frame.

According to yet another embodiment, the clamp frame comprises two clamp frame parts,

each supporting one clamp. Tests done by the applicant has shown that operation of the device is improved and the reliability improved if the clamp frame is divided in two, preferably independent, clamp frame parts each supporting one clamp.

- 5 The clamp frame parts may be operated by separate actuators. When the clamp frame parts are operated by separate actuators, the control and fail safe properties of the device is further improved.

10 The top part of the teeth are preferably slanting towards the gap to guide a chain, wire or cable towards the gap.

### Short description of the figures

- The present invention will now be further explained by use of the enclosed figures, where
- 15 Fig. 1 is a bird's eye view of a shark jaw and tow pins,  
Fig. 2 is a view of a shark jaw seen from the aft deck of a vessel towards aft of the vessel,  
Fig. 3 is view of a shark jaw seen from abaft,  
Fig. 4 is a cross section along A-A of figure 2,  
Fig. 5 is a view corresponding to fig. 2, where a cover is removed,  
20 Fig. 6 is a view corresponding to fig. 2, where a cover and clamp frame are removed,  
Fig. 7 are sections corresponding to figure 2 of a first alternative embodiment,  
Fig. 8 are sections corresponding to figure 2 of a second alternative embodiment,  
Fig. 9 is a bird's eye view of an alternative embodiment of the shark jaw and tow pins,  
and  
25 Fig. 10 is a perspective view of an alternative embodiment having tow pins integrated with the shark jaw.

### Detailed description of the invention

- Figure 1 is a bird eye's view of a first embodiment of the present locking device, or  
30 "shark jaw" 1, arranged at an aft deck 2 of a vessel together with a pair of tow line guide pins 3 provided with cross members 4.

The orientation of the shark jaw and tow pins is indicated by an arrow B pointing in the length direction towards the bow of the vessel. A chain 8 is arranged in the shark jaw and

between the tow pins 3 to illustrate the position of the chain 8 in active use of the shark jaw and tow pins. The tow line guide pins 3 and cross members 4 are of a well known type that may be lowered into the deck of the vessel, and where the tow pins 3 or a top part thereof, may be rotated to move the cross members from a first position as illustrated in the figure, to an open position where the cross members are running substantially parallel to the chain 8 to allow the chain to be lifted out over the tow pins. Even though the tow pins and shark jaw are illustrated in their active position in figure 1, the tow pins and shark jaw may be used independently of each other.

10 The sharkjaw comprises a fork shaped main body 5 having two teeth 6 defining an opening 10 between them. The distance between the two teeth 6, or the opening 10, is wider than the diameter of the maximum chain diameter (diameter of each chain link) to be used with the sharkjaw. Adjustable clamps 7 are arranged on the teeth 6 as described in detail below, to allow for adjusting the distance between the claims according to the  
15 dimension of the chain 8.

Figure 2 illustrates a shark jaw 1 in its active, or upper, position seen from the deck towards the stern of the vessel. A cover 11 covers a recess at the front part of the main body 5 and parts of the teeth 6 of the shark jaw . The cover 11 is fastened to the main  
20 body by means of bolts 12, 13, 14.

Figure 3 illustrates the sharkjaw seen from abaft.

Figure 4 is a illustrates the section A-A of figure 2, and shows the adjustable clams 7 arranged in a recess in the main body 5 and teeth 6 supported by the cover 11 and resting  
25 on a support member 15 at the lower end of the adjustable clamp. The recess, cover and base member define a track for the movement of the clamps 7, to make a track in which the clamps are displaceable arranged. The adjustable inserts 7 are allowed to be displaced horizontally substantially perpendicular to the length axis of the vessel to adjust the gap between the inserts 7.

30

A clamp frame 16 is also arranged in the recess in the main body, covered by the cover 11. The clamp frame is adapted to be moved substantially vertically by means of not shown actuators, in the recess in the main body 5 and teeth 6.

The clamp frame 16 is operateably connected to the adjustable clamps in that slanting surfaces 20 of the clamp frame rests against correspondingly slanting surfaces 20' of the adjustable clamps. In the devices illustrated in figures 5 and 7, and upwards movement of the clamp frame 16 will cause the adjustable clamps 7 to be moved against each other to reduce the distance between the clamps 7. When the clamp frame is lowered, the adjustable clamps 7 are moved away from each other by means of guide pins 18, 18' connected to the clamp frame 16 and are inserted into guide tracks 19, 19' in the adjustable clamps, resulting in the adjustable clamps being removed from each other, due to the guide tracks being inclined relative to a horizontal line. Preferably, the guide track are inclined at the same angle as the slanting surface 20.

The embodiment according to figure 5 has two slanting surfaces 20, 20' for each of the two adjustable clamps, whereas only one slanting surface for each of the adjustable clamps are present in the embodiment of figure 7.

Guide rods 22 that are arranged in vertical guide tracks 21, may also be provided to guide the clamp frame. Additionally, cutouts 17, 17' is preferably provided for the bolts 13, 13'.

In an offshore operation where the shark jaw is to be used for locking a wire, cable or chain, the adjustable clamps are remotely adjusted according to the diameter of the wire, cable or chain to allow them to be inserted between the adjustable clamps without being squeezed between the clamps. When used for a wire or a cable, a wire clam or wire lock arranged on the wire or cable will be stopped by the adjustable clamps and thus be locked to the shark jaw. When using the shark jaw or a chain, the next chain link will be caused to rest against the adjustable clamps if the shark jaw is correctly adjusted, to lock the chain to the shark jaw.

The teeth 6 are preferably inclined towards the opening 10 to provide a self centring effect to lead a chain, cable or wire that is placed between the teeth towards the opening 10 and into engagement with the inserts.

At the high tension side of the shark jaw, normally towards the aft end of the vessel, a support part 9 of the main body is provided aft of the opening 10 as a support for the first chain link aft of the opening 10.

The present shark jaw is remotely adjustable so that the shark jaw may be used for several dimensions of chain, cable or wire. Preferably, the distance between the inserts corresponds to the diameter of the chain, so that a vertically arranged chain link fits in  
5 between the inserts. A chain that is too large will not fit into the locking opening, resulting in no or inadequate locking. If the distance between the inserts is too wide, the result may again be poor or inadequate locking and even damages on the chain.

Both the shark jaw 1 and the tow line guide pins 3 are preferably vertically displaceable  
10 so that they may be moved from stowed position where the top of the shark jaw and/or the tow pins are at the level with or below the deck 2, and to an active position where the active parts of the shark jaw and tow pins are above deck. Not shown cover(s) that may be handled manually or automatically, may be present to cover the shark jaw and / or the tow pins when they are in the lower or stowed position. The shark jaw and tow pins are  
15 arranged in recesses in the deck supported by not illustrated structures below deck and connected to actuators and controls for the operation of the shark jaw and tow pins as described below. It is preferred that the shark jaw and the guide pins may be lowered into and ejected from the deck 2 independently of each other. The guide pins in this  
20 embodiment are conventional guide pins, e.g. as known from US 4.503.649, which is included in the present description as reference. Locking members 4 arranged at top of the guide pins may be rotated about the vertical axis of the guide pins from an open position where the locking members are parallel to each other and are substantially parallel with the length axis of the vessel, and a locked position where the locking members faces each other and prevents a chain, a line of wire positioned between the  
25 guide pins to be drawn up above the guide pins.

The main body 5 of the shark jaw is according to one embodiment, connected to a substantially tubular base member 23 that is vertically displaceable between a position where the shark jaw is below deck, and a position where the top of the base member is  
30 substantially flush with the deck. The base member is arranged in a supporting structure to give the shark jaw the necessary support and strength.

Figure 7 is a view A-A also including the base member 23, of an alternative embodiment, where the clamp frame 16 is split into two parts 16', 16'', one part 16', 16'' supporting

one of the clamps 7. Each part is here controlled by an individual actuator 25. The actuators, both in this embodiment and the other embodiments of the invention, may be hydraulic actuators or electrical actuators as illustrated in figure 7. The electrical actuators 25 illustrated in figure 7 is connected to a treaded bar 26 having a treaded connection to either the actuator 25 or a treaded member of the clamp frame part 16', 16" so that a rotation in the actuators is converted into a vertical movement of the clamp frame part 16', 16".

Figure 8 illustrates an alternative embodiment in views corresponding to the view of figure 2, where only one slanting surface is present per clamp. The figure to the left illustrates the shark jaw having wide gap 10, whereas the view to the right illustrates a more narrow gap 10. The figure clearly illustrates that the upper position of the clamp frame corresponds to a narrow gap 10 and the lower position to a wide gap.

Figure 9 is a bird's eye view of a shark jaw 5 according to the present invention combined with tow pins. The locking members 4 of the tow pins 3, are closed. The tow pins may be lowered into the deck into recesses 24 when not in use.

Figure 10 is a perspective view of an embodiment of the present shark jaw where the tow pins 3 and shark jaw is combined into an integrated unit.

## Patent claims

1.

A locking device for temporary locking and securing of a chain, cable or wire, comprising a  
5 fork shaped main body (5) comprising two teeth (6) where clamps (7) extending from the  
teeth (6) towards each other, the clamps having substantially vertically arranged edges (7')  
facing each other and defining a substantially vertical gap (10) between the edges (7'), where  
the distance between the clamps being adapted to the diameter of a chain link or cable or a  
10 wire so that it may pass into the gap, but where a next chain link of a chain or a clamp on a  
cable or wire, is stopped against the clamps to lock or secure the chain, cable or wire, wherein  
the locking inserts are substantially linear and horizontally displaceable for adjustment of the  
gap (10) between the clamps (7) according to the diameter of the cable, wire or chain link.

2.

15 The locking device according to claim 1, wherein the clamps (7) are arranged in a track in the  
main body (5) of the locking device.

3.

The locking device according to claim 2, wherein the track is defined by a recess in the main  
20 body (5), a cover (11) covering the recess, and a support member (15).

4.

The locking device according any of the preceding claims, wherein a substantially vertically  
displaceable clamp frame (16) is arranged in the groove and covered by the cover (11), the  
25 clamp frame (16) comprising one or more slanting surface(s) (20) that is/are arranged to  
interact on correspondingly slanting surface(s) (20') on the clamps (7) to displace the clamps  
(7) substantially horizontally when the clamp frame (16) is moved vertically.

5.

30 The locking device according to claim 4, wherein guide pins (18, 18') fastened to the clamp  
frame (16) are arranged in corresponding slanting guide tracks (19, 19') arranged in the  
clamps (7).

6.

The locking device according to claim 4, wherein guide pins (18, 18') fastened to the clamp (7) are arranged in corresponding slanting guide tracks (19, 19') arranged in the clamps frame (16).

5 7.

The locking device according to any of the preceding claims, wherein the clamp frame (16) comprises two clamp frame parts (16', 16''), each supporting one clamp (7).

8.

10 The locking device according to claim 7, wherein the clamp frame parts (16', 16'') are operated by separate actuators (25).

9.

15 The locking device according to any of the preceding claims, wherein the top part of the teeth (6) are slanting towards the gap (10) to guide a chain, wire or cable towards the gap (10).

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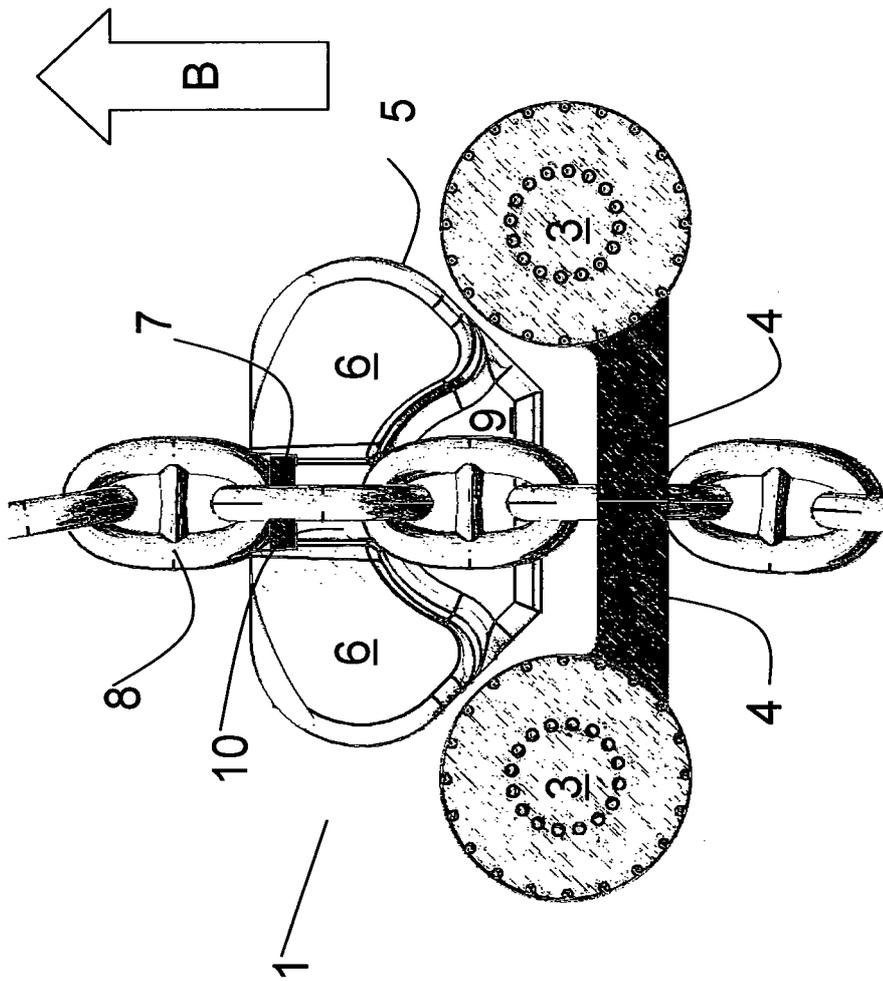


Fig. 1

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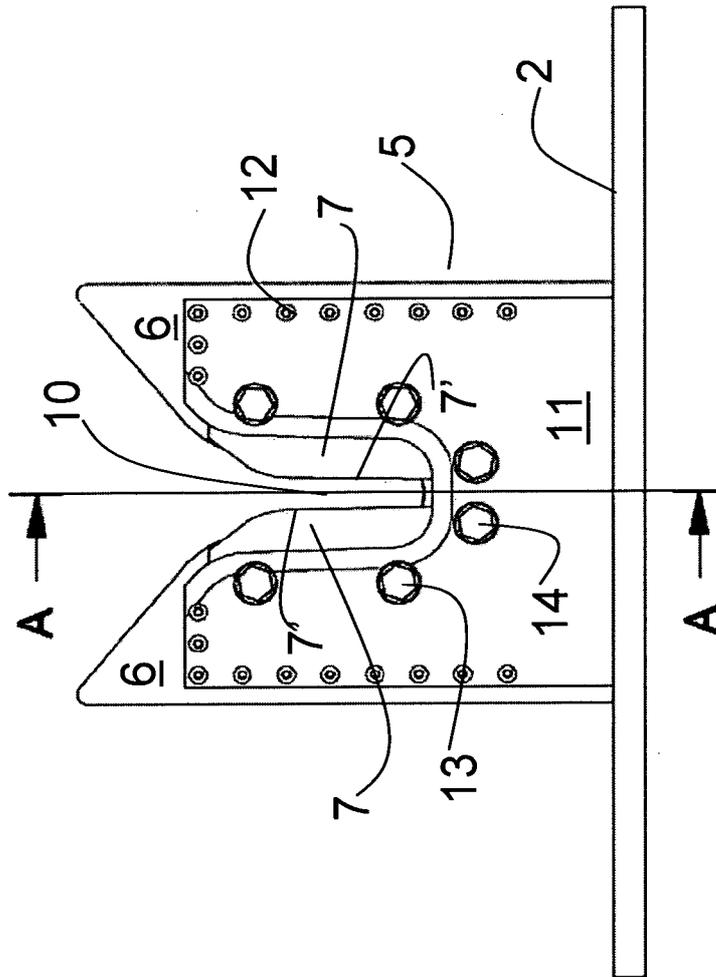


Fig. 2

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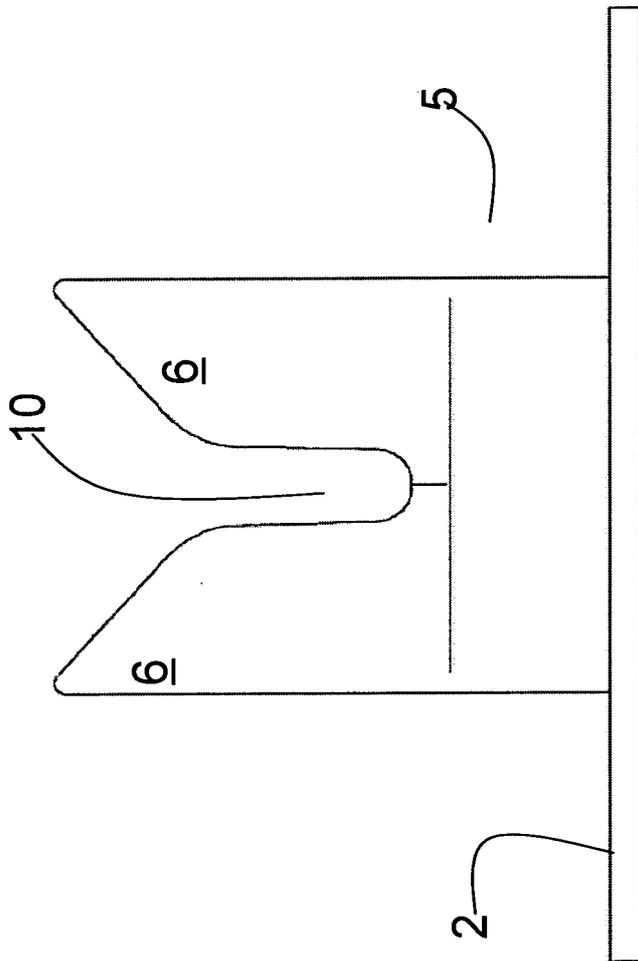


Fig. 3

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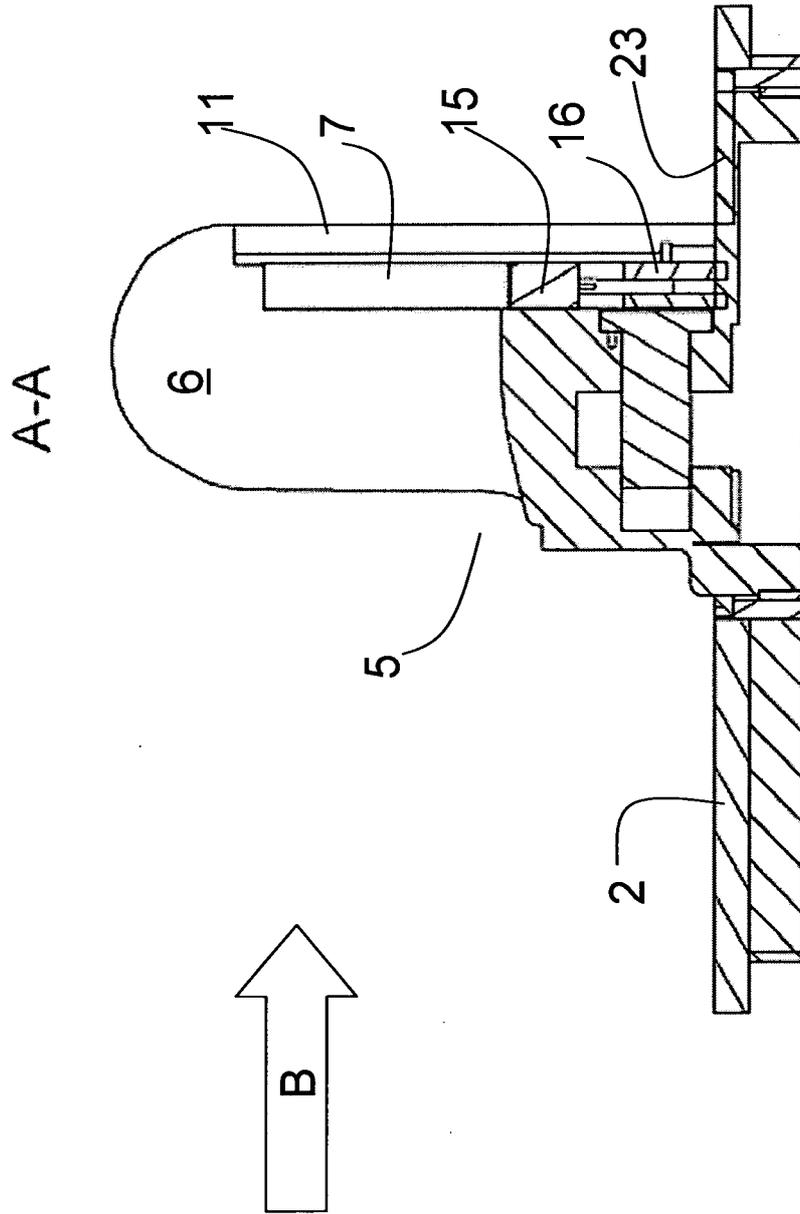


Fig. 4

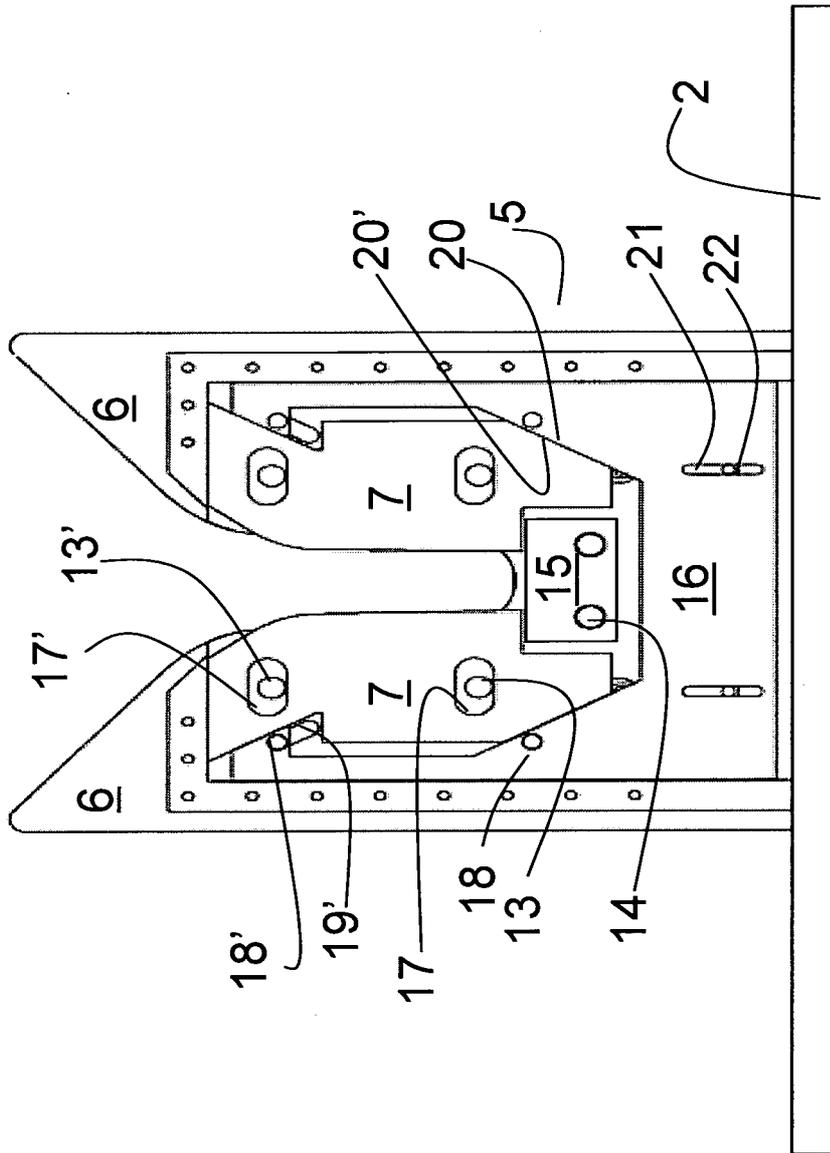


Fig. 5

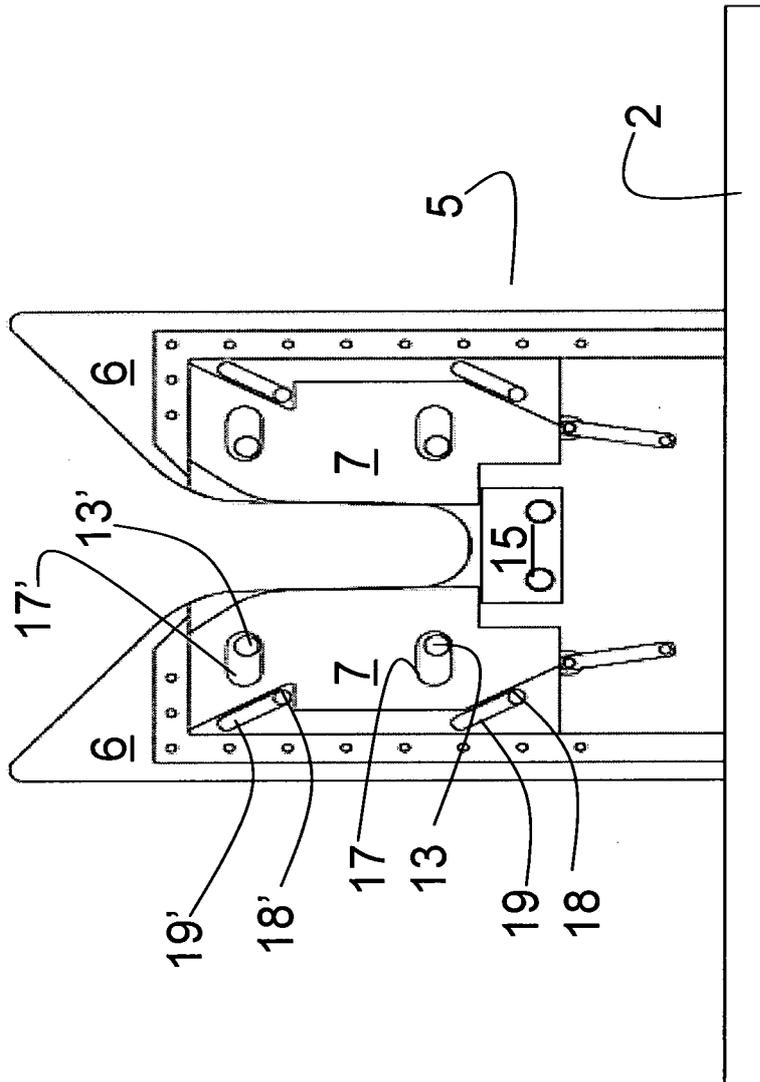


Fig. 6

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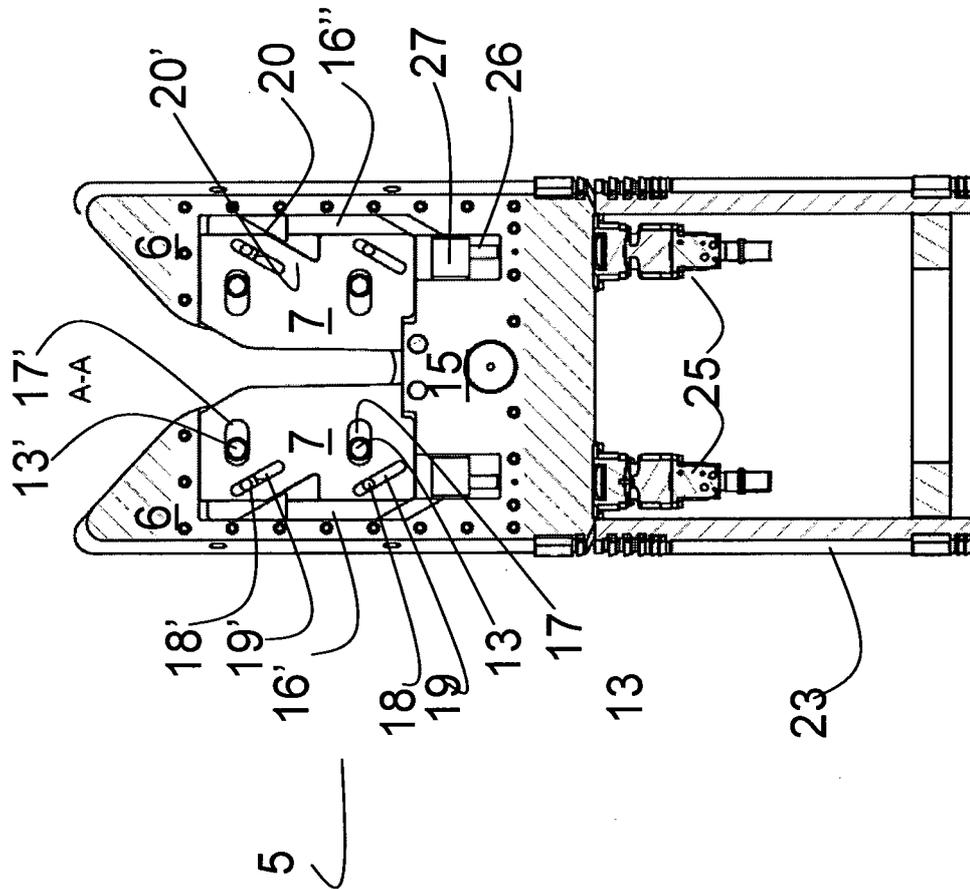


Fig. 7

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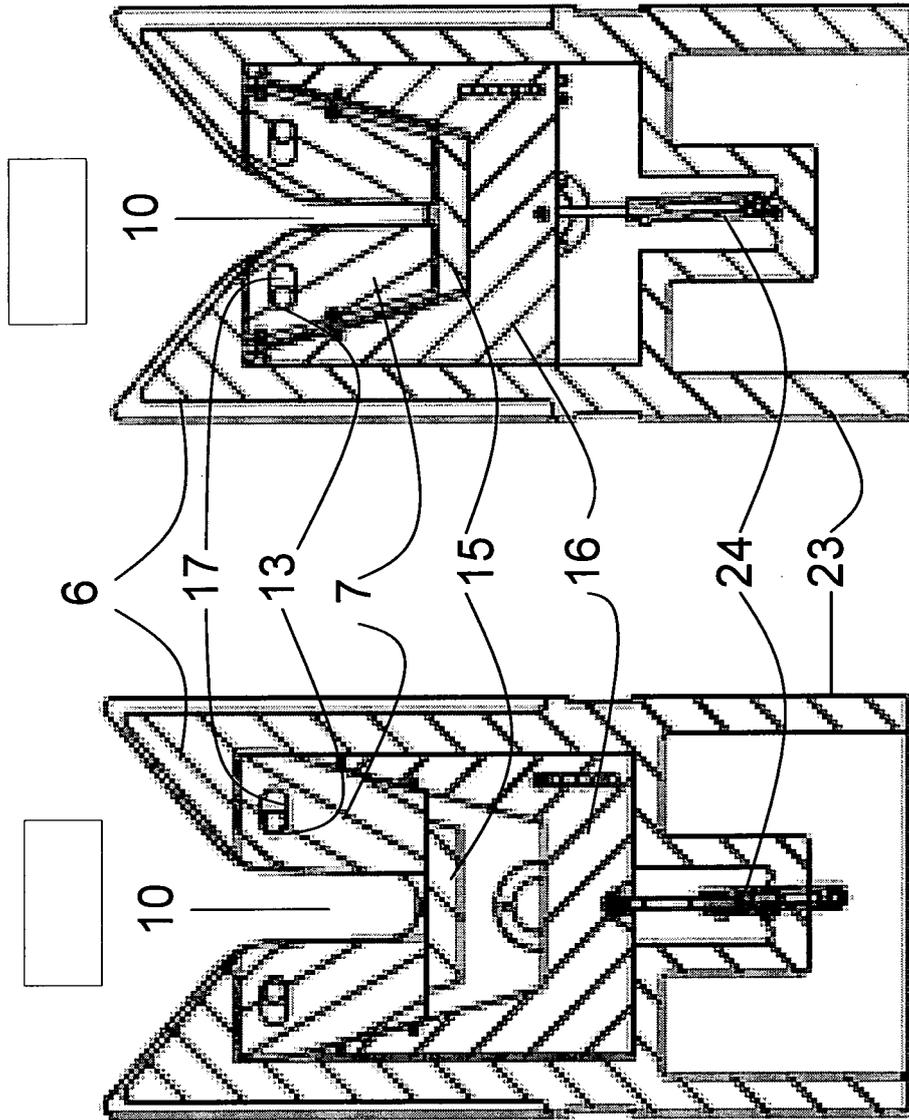


Fig. 8

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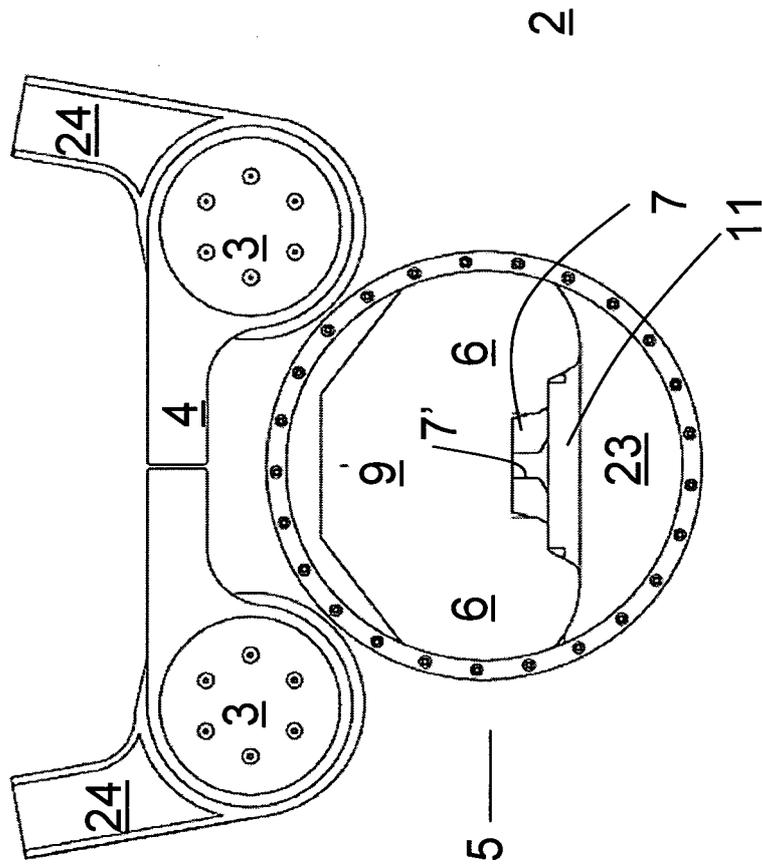


Fig. 9

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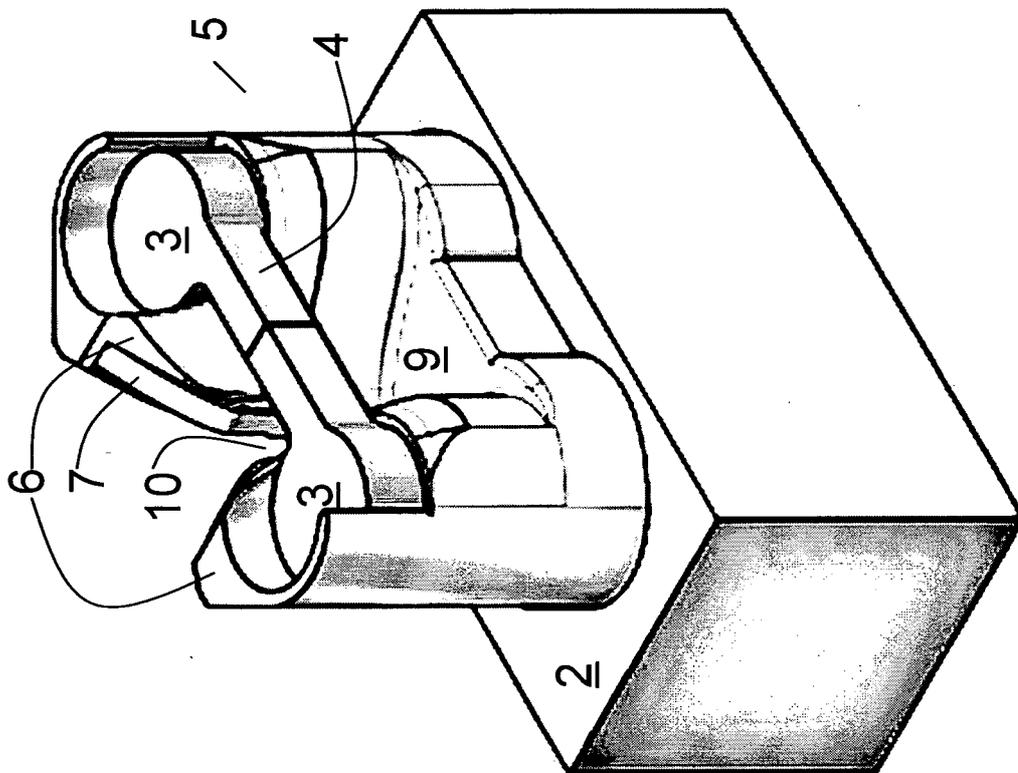


Fig. 10

# INTERNATIONAL SEARCH REPORT

International application No  
**PCT/N02008/000210**

A CLASSIFICATION OF SUBJECT MATTER  
**INV. F16G11/04 F16G15/00**  
**ADD. B63B21/18**

According to International Patent Classification (IPC) or to both national classification and IPC

**B FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
**F16G B63B**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**EPO-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication where appropriate, of the relevant passages                        | Relevant to claim No |
|-----------|--|----------------------|
| <b>X</b>  | <b>US 4 093 042 A (PRADON JACQUES)</b><br>6 June 1978 (1978-06-06)<br>figures 1-13<br>-----              | 1-8                  |
| <b>X</b>  | <del>US</del> 3 758 922 <del>A</del> (FIELD G)<br>18 September 1973 (1973-09-18)<br>figures 1-3<br>----- | 1, 2, 4, 5,<br>7     |
| <b>X</b>  | <b>FR 343 409 A (R. KUHNLE &amp; C. IMSENG)</b><br>6 October 1904 (1904-10-06)<br>figures 1,2<br>-----   | 1, 2, 4, 5,<br>7     |
| <b>X</b>  | <b>GB 399 305 A (GEORGE WILLIAM GENTLE)</b><br>5 October 1933 (1933-10-05)<br>figures 1-5<br>-----       | 1,9                  |
|           | -----<br>-/--  |                      |

Further documents are listed in the continuation of Box C

See patent family annex

\* Special categories of cited documents

- <sup>1</sup>A<sup>1</sup> document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

**15 October 2008**

Date of mailing of the international search report

**24/10/2008**

Name and mailing address of the ISA/  
 European Patent Office, P B 5818 Patentlaan 2  
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Authorized officer  
  
**Das Neves, Nelson**

## INTERNATIONAL SEARCH REPORT

International application No

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| C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |  |                      |
|---|--|----------------------|
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No |
| X   | <p>MATS AUGDAL HEIDE OG INGRID BOUWER UTNE:<br/> "HMS i havbruk - utvikHng og<br/> implementering av teknologi for forbedret<br/> perso /sikkerhet Delprosjekt store krefter"<br/> SINTEF FISKERI OG HAVBRUK AS, [Online] no.<br/> sfh80-a064050, September 2006 (2006-09),<br/> pages 1-71, XP002499802<br/> Internet<br/> Retrieved from the Internet:<br/> URL :http://www.tekmar.no/tema/hms/SFH80A06<br/> 4050.pdf&gt; [retrieved on 2008-10-15]<br/> page 32 - page 34<br/> page 63 - page 66</p> <p>-----</p> | 1-3,8,9              |
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/N02008/000210

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date                       |
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| GB 399305                              | <b>A</b>         | 05-10-1933              | <b>NONE</b>                            |
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